Probability

Probability means possibility. It is a branch of mathematics that deals with the occurrence of a random event. The value is expressed from zero to one.

For Example

Tossing a coin : {H, T}

$$P(H) \; = \; \tfrac{1}{2} \; = \; 0.5 \qquad\qquad P(T) \; = \; \tfrac{1}{2} \; = \; 0.5$$

Rolling a Dice: {1, 2, 3, 4, 5, 6}

$$P(1) \; = \; \tfrac{1}{6} \; = \; 0.16 \qquad\qquad P(Even) \; = \; \tfrac{3}{6} \; = \; 0.5$$

Mutual Exclusive Events

Two events are said to be mutually exclusive if they cannot occur at the same time or simultaneously. Examples include: tossing a coin or rolling a dice

Additive Rule for Mutually Exclusive Events

What is the probability of a die showing a number 3 or number 5?

$$P(3) \; = \; \tfrac{1}{6} \; = \; 0.16 \qquad\qquad P(5) \; = \; \tfrac{1}{6} \; = \; 0.16$$

$$P(3 \; or \; 5) \; = \; P(3) \; + \; P(5) \; = \; 0.16 \; + \; 0.16 \; = \; 0.32$$

Non-Mutual Exclusive Events

Non-mutually exclusive events are events that can happen at the same time. Examples include: driving and listening to the radio, even numbers and prime numbers on a die

Additive Rule for Non-Mutually Exclusive Events

What is the probability of a taking a card out of a deck, that card is a king or heart

$$P(King \; or \; heart) \; = \; P(K) \; + \; P(H) \; - \; P(K \; and \; H)$$

$$P(King\ or\ King\ of\ heart)\ =\ \frac{4}{52}\ +\ \frac{13}{52}\ -\ \frac{1}{52}\ =\ \frac{17}{52}\ -\ \frac{1}{52}$$

$$P(King\ or\ King\ of\ heart)\ =\ \frac{16}{52}$$

Independent and Dependent Events

Two events are said to be dependent if the occurrence of one event changes the probability of another event.

Two events are said to be independent events if the probability of one event does not affect the probability of another event.

If two events are mutually exclusive, they are not independent. Also, independent events cannot be mutually exclusive.

Multiplication Rule for Independent Events

$$P(H\ and\ T)\ =\ \frac{1}{2}\ *\ \frac{1}{2}\ =\ \frac{1}{4}$$

Multiplication Rule for Dependent Events

What is the probability of taking out a kings card and then a queens card from the deck

$$P(K\ and\ Q)\ =\ P(K)\ *\ P(Q/K)$$

$$P(K\ and\ Q)\ =\ \frac{4}{52}\ *\ \frac{4}{51}\ =\ 0.006$$